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EXPERIMENTAL MUSICAL INSTRUMENTS

FOR THE DESIGN, CONSTRUCTION AND ENJOYMENT OF NEW SOUND SOURCES

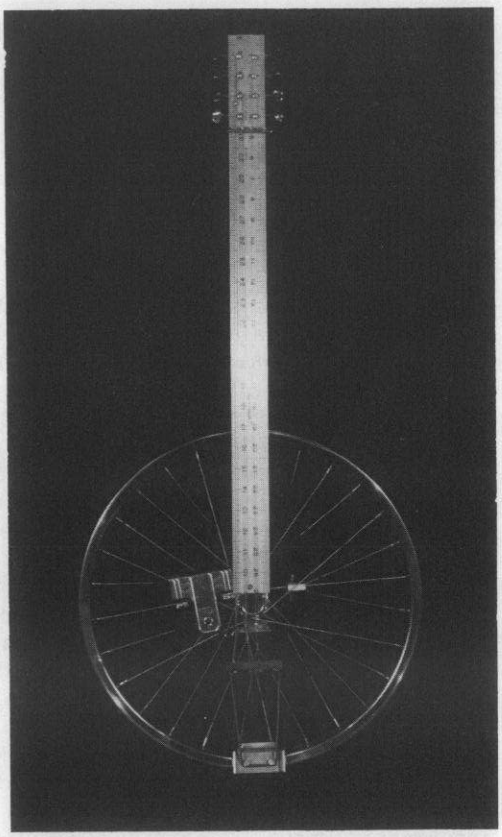
OUR SUMMER NEW YEAR

The last issue completed EMI's second year of publication, and with this we begin the third. In the last two years we have looked at a lot -- I mean, really quite a lot -- of very diverse instruments. On this end of things it has been a great learning experience to say the least, and we hope and trust it has been for readers as well. And, of course, there is more to come. Already in the pipeline for the coming year are articles on a flock of interesting subjects.

In the editorial that appeared last year at this time I stressed the importance of reader contributions to EMI, and I'd like to do so again. We have received some very fine articles from readers. The diversity of sources has enriched the publication greatly. Letters to the editor, whether casual and light or serious and substantial are also a great source of life and light to EMI's pages. I enjoy reading and sharing those letters as much as any part of this job. And comments and suggestions from readers, whether for publication or not, are essential in letting EMI know how best to serve its community. To everyone's benefit, we have received valuable suggestions for books or recordings to review, articles to mention in the "Recent Articles" column, and

(continued on page 19)

IN THIS ISSUE



THE BICYCLE WHEEL, BUILT BY KEN BUTLER. SEE ARTICLE ON PAGE 6.

I ENJOYED YOUR NOTE on the musical saw in the last issue. I'm a saw player myself. You might mention at some point in EMI another source for saws. Charlie Blacklock in Alameda, California sells a fine line of musical saws and bows, etc. I have one of his 36 inch mini-bass saws. It takes a fair reach to play it but the range is wonderful. Here's his address:

Charlie Blacklock
1821 St. Charles Street
Alameda, CA 94501

"When a massed bank of possibly a hundred or more saws cuts loose, God Almighty, the pigs will quit littering, coyotes will quit whelping, and the timber wolves will head for the tall uncut! ...The noise may not be heavenly, but it certainly will be UNEARTHLY!"

- Tom Scribner, saw historian

Keep up the good work.

Hal Rammel

GREETINGS FROM DOWN SOUTH ****

I can answer some of your questions [from EMI's last issue's editorial] immediately!

Jim French, 321 Barbara Avenue, Solana Beach CA 92075, has been exploring double and single reed instruments and also some kinds of brasses. I have seen and heard his instruments, so this is one person I am sure of, and there are others I believe.

The continuous pitch controls for electronic instruments are almost as old as I am, maybe older. Some current synthesizers can be connected to them. More notable is the instrument in Europe (quite old now, and respected on the Continent, if not here) called les Ondes Martinot. I saw one once. It has a dummy keyboard to show where the notes are, but there is a continuous control of a variable capacitor (same idea exactly as the tuning of a radio set) and the electronic innards of this instrument are somewhat like those of the Thereminvox. Theremin invented a sort of cello-like instrument with a continuous resistance controller. No reason why that can't be built now. The only problem is psychological: The ghost of the Piano haunts us after the real instrument has gotten too expensive and too cumbersome for today's life-styles. So everything else tries to imitate the piano and its keyboard. This keeps information about such things as ribbon-controllers (the commonest name for those electronic continuous-pitch affairs you were asking about) from being circulated as much as it should. After all, there are a jillion violinists and cellists in the world and they should be able to use these variable-resistance deals with their present technique. Also, we come factory equipped with an analog musical instrument, and nobody dares put frets on our vocal cords! I hope.

[Note from a later letter written by Mr. Darreg: One form of the Trautonium also had a ribbon controller -- early 30s.]

RE your #3, one acoustic possibility that comes to mind is the old 1920s phonographs which had megaphone-type horns, and the throat of the horn was driven by a diaphragm which in turn was driven by a lever connected to the phono needle. Now it should be possible to make horns of that kind, and drive the little diaphragm with something else, such as a plucked reed or a kalimba or a bowed string or a bowed something else or several other possible kinds of vibrators. This would work best in the middle and treble registers. (I drove my cello teacher bonkers by bowing on the little box

EXPERIMENTAL MUSICAL INSTRUMENTS
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the rosin came in -- it was very loud and strident.) There was a gizmo used in the 20s called the Stroh Violin -- there was no body, but the bridge drove a brass horn to get enough power to make an acoustic recording. I never heard one, but I've seen many pictures and descriptions.

The real problem is NOT that of inventing new instruments -- it's Where do you PUT them after you've made them? What do you do when you have to move? When your dwelling is sold out from under you several times in succession? And even more important: How do you give other people access to your instruments who deserve access? So they will be used instead of destroyed?

Ivor Darreg

[Editors note: the following letter from George Jordan was sent to EMI after we inquired about the possibility of his writing something about an instrument he has made. It uses Caterpillar tractor gears, made of specially formulated and tempered metal, to produce an unusually clear percussion tone. As it turns out, you won't be seeing anything written about the instrument -- here's why:]

REGARDING THE MUSICAL GEARS AND RODS, I can't do an article because the metal tempering process is a Caterpillar "trade secret." They are like an armed camp. A military complex is more easily entered. The only way I got as far as I did was by finding some in the engineering lab at the university where I work. Then, one night I ran into a drunk metallurgist from the Caterpillar company. I primed him for the rest of the knowledge. This was my first exposure to industrial secrets. They are nuts to say the least. It shows though that even in the earth industries there is music somewhere... even in gearboxes that can survive jungle heat and arctic cold. Now if they could focus on the music and drop the war...

George Jordan

RECEIVING YOUR EMI MAGAZINE is always an enormous pleasure. Many thanks for all the joy you give me. I must congratulate you for the amount of work you are achieving to process 6 issues every year.

Vol.II #5 -- Destructive communication: A musical instrument is a device that creates first a stationary wave. Then this stationary wave has to create a progressive wave in the air. The second part is the most difficult.

Consider a vibrating rod vibrating with one single node at its base, and fixed on a board, alone. If you stroke it with a bow, you get a nice sound. If you fix another vibrating rod close to the first one, and if the frequency is similar, you build a tuning fork. When you stroke one rod, the other one vibrates by sympathy. You create a standing (stationary) wave. Tuning forks make fine standing waves but poor progressive waves: because of the symmetry of the system little energy goes to the handle (base) of the fork, and to the board.

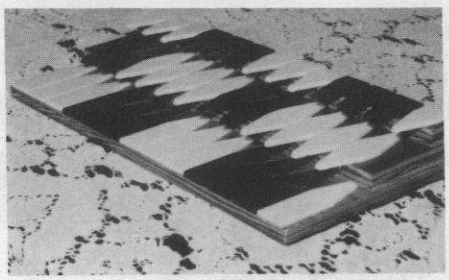
The best solution is to use heavy boards (we call it "gums").

There are patents for noise-insulation of machines and electric razors based on this principle: Parallel to the machine, there is a swinging weight at the end of a spring. The frequency of the spring is tuned to the machine. When the machine works, there is a standing wave (like a tuning fork) between the swinging weight and the machine. Only a faint progressive wave comes out from the system, and the neighbors can sleep steadily.

Francois Baschet

[From the editor: Appearing in our last issue's letters column was a letter from Tom Reed responding to EMI's recent alternative keyboards article and talking about 6-6 keyboards. We have since received a photograph of a model of the Diamond Keyboard designed by Tom Reed for 6-6. That photo and his accompanying notes follow.]

I THINK IT IS EXTREMELY HELPFUL to have a drawing or photograph to illustrate the 6-6 layout of keys, therefore I herewith enclose a photo of my Diamond Keyboard design.



There are other designs for 6-6 keyboards, for example the well-known but not very practical Janko keyboard, the Paul Vandervoort 4-level 6-6 keyboard, the Howe-Way Keyboard (by Hilbert Howe), Hanfling's keyboard (of 1708, the earliest we know about), and several others. My personal preference is for the Diamond, but there is no general agreement on a standard design.

The key spacing on the Diamond Keyboard as shown in the photograph is exactly that of a standard 7-5 or traditional keyboard, .922 inches (34.4 mm). Thus, scale and chord playing are quite comfortable on the new keyboard, plus the octave span is one white key shorter, making an octave easier to reach, and making it easier for adults to reach the span of a 10th.

All scales and chords are proportionally spaced on this keyboard, of course. A major chord pattern is the same starting on any of the 12 notes. The interval of the perfect 5th, for example, is readily seen to extend over $3\frac{1}{2}$ whole steps, so that a perfect 5th always has one tone on one tier, and the other tone on the adjacent tier, without exception.

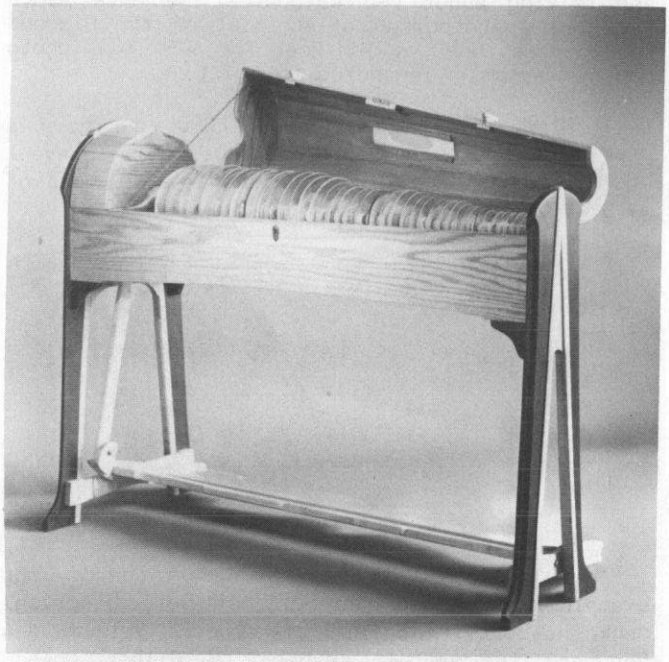
Doug Keislar and Paul Vandervoort are probably

the two most experienced performers on the 6-6 keyboard.

Tom Reed
Music Notation Modernization Assoc.
PO Box 241, Kirksville, MO 63501

I'M HAPPY TO SAY my address won't be changing again for a while. After a few months hiatus I am back in Urbanaland and am setting up a woodshop with a fellow woodworker. Part of the reason for doing this is to be able to make musical instruments on commission on a more regular basis.

The commissions I've had include a glass marimba (made entirely of glass with mallets and some supporting structure of plexiglas), a keyboard chime instrument I call a Tintinabulon, a glass harmonica, and several medieval instruments of the noisy variety (ratchets, hammer-klappers, etc.).



GLASS HARMONICA BY MICHAEL MEADOWS
Photo by Serge Gubelman

In the interest of getting in touch with folks who might want to commission an instrument and/or just correspond, I'd like to "advertise" in EMI. My business address is:

Michael Meadows
P.O. Box 4038
Urbana, IL 61801
(217) 384-8873

Denny Genovese's article on fipple pipes [EMI Vol. II #5, February 1987] prompts me to toss in my experiences. In 1977 I stuck a recorder mouthpiece on a 5-foot length of garden hose and discovered the same cascade of harmonics. The pitch could be determined, however, not only by breath velocity but also by slightly pinching the hose at the point where the upper node of the desired harmonic is located. All you have to do is figure out how the air vibrates in there and you can

GLASS MARIMBA BY MICHAEL MEADOWS
Photo by Serge Gubelman

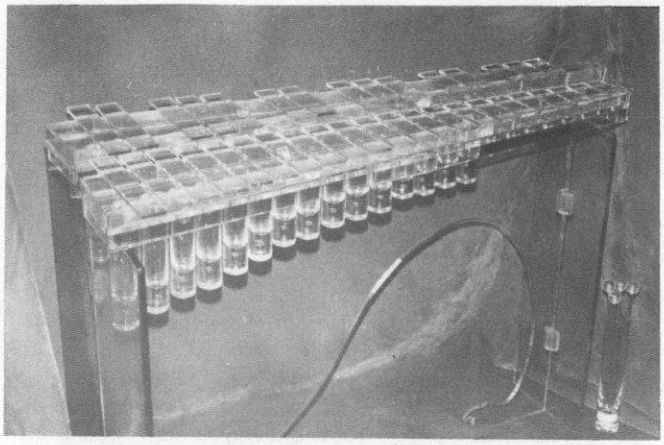
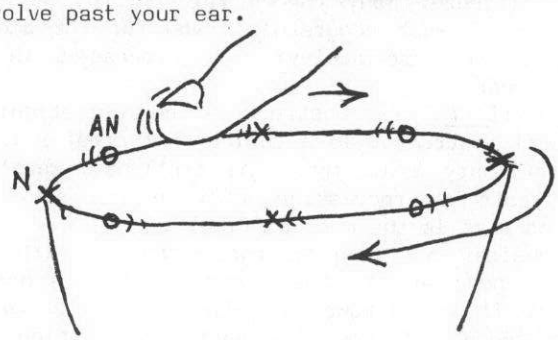


figure out where the nodes are for each mode of vibration. Fun? You bet it was. At least until it was time to water the garden and I had truncated my means of doing so.

Lately I've been experimenting with a notched flute type of "mouthpiece" carved into the end of varying lengths and diameters of plastic plumbing pipe. This has resulted in an instrument which is not as agile melodically and is also more difficult to play. Nonetheless, the resulting tone quality is quite amazing. Sweet, but with a very fine edge to it. Not unlike that of the Japanese shakuhachi.

Regarding the glass harmonica and the vibrational pattern of the bowls: when a bowl is vibrating in its fundamental mode, there will be <u>four</u> nodes and antinodes evenly spaced around the rim. This can be shown by bowing the glass at 0 degrees and touching the rim lightly at 45, 135, 225 and 315 degrees. These are the points where the four nodes are located and the tone will not be deadened. Touching the rim at 90, 180, and/or 270 degrees will muffle the tone. These are the points of maximum vibration, the antinodes.

With a glass harmonica (or just playing a wineglass), this vibrational pattern travels <u>around</u> the glass, an antinode trailing just behind the finger. Play a wineglass and you will hear a vibrato which pulses four times with every revolution your finger makes and the nodes and antinodes revolve past your ear.



The nodes depicted on the rim are not truly representational. Each node is actually a line extending downward from the rim to the base of the glass or bowl.

Also, the vibrational pattern can be made visible by first filling the glass 1/3 to 1/2 full

of water. Then, as the rim is rubbed and the glass begins to sing, the surface of the water, agitated by the vibrating glass, will form into a revolving four-sided pattern. A thin-walled glass works well for this.

By the way, loved the EMI tape. "New York, New York" never sounded better.

Michael Meadows

The following is a letter from Siemen Terpstra (contributor to EMI and many other publications; theorist and explorer of pitch organization systems) to Mel Sohler, written in response to Mel's article in the February issue of EMI. Siemen sent a copy to EMI as well, feeling that in a subject so ripe for debate and discussion, his observations might be worth passing on.

HELLO MEL,

...I feel, along with you, that the way of progress for the musical future is to redesign the keyboard pattern itself. The old medieval "7-5" keyboard lacks symmetry, yet is being used for a tuning system which exhibits maximal symmetry. The only enlightened approach is to opt for a symmetrical pattern.

I am sure that you are familiar with the **Musical Six-Six Newsletter** that deals with various designs of "6-6" symmetrical keyboards. Using this same terminology, we could call your keyboard an "8-4" keyboard, since the pattern uses eight "white" keys and four "black" keys. It is also possible to design a keyboard for 12-E.T. which we could call a "9-3" keyboard. The suitability of the design comes from the nature of the tuning system, which allows a symmetrical division by two, three, four, and six -- but not by five.

Although I think that your design is excellent for efficiency as well as aesthetic beauty, let me make a couple of constructive criticisms.

Firstly, the span is increased over the standard keyboard and the 6-6 keyboards. Whereas, on the standard keyboard, we must stretch eight keys to play an octave, on the Sohler Keyboard we must stretch nine keys. On the other hand, with the standard 6-6 keyboard as well as the Janko keyboard, we need only stretch seven keys to make an octave. The 6-6 keyboards thus have a playing advantage. There is more "information" in a smaller space.

The second criticism may or may not be relevant to you, depending on what musical direction you wish to take. And that is the fact that this design (as well as the 6-6 designs) are well suited for one tuning system only, for 12-E.T. The design tends to "lock" us into this tuning system because the design itself promotes a symmetrical 12 note pattern. The effort to reform the notation system goes hand in hand with this approach. It is true that the notation of sharps and flats is redundant for 12-E.T. since the enharmonic is compromised and eliminated in the tuning system. Thus such a notation system as yours is eminently suited to the 12-E.T. system. But (fortunately or unfortunately depending on one's attitude), the enharmonic is a perceptual reality. Violin players use it, wind players use it, singers use it; in fact, almost all musical instruments are capable of using it since our ears can hear it. The traditional keyboard, however, as well as the 6-6 designs and your design, force one to choose between a sharp and a flat, since no key is provided for both. Consequently we are steered toward 12-E.T.

So what is the answer to this problem? It seems to me that the answer is to design a keyboard which is **inter-system**, or capable of being played in various tuning systems with equal ease. On such a keyboard we can just as easily play in 12-E.T., or in 31-E.T. (Quasi-Quarter-Comma-Meantone) without the need to relearn finger patterns. Such a design would very much advance the understanding of the nature of musical harmony, as well as promote new musical resources. It would help the keyboard "catch up" to the other musical instruments in subtlety of harmonic expression.

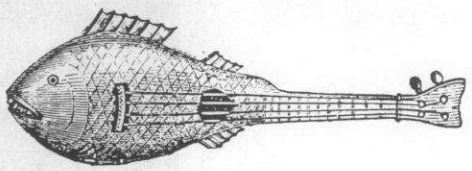
Various Generalized Keyboards have already been invented, with this aim in mind. Most notable are those designs which alter the Bosanquet design. I myself have come up with a design which, I feel, has great promise. But I am in the same position as you -- I need funding and expertise in having it developed.

The spate of new designs which have surfaced of late indicates that there is a real need out there. I see no necessity to restrict keyboards to any one pattern, traditional or otherwise. It is heartening to see this activity, this foment of new ideas. We should all support each other in getting out products "out." I will certainly help spread your concept where I can.

Meanwhile, I am
Yours in the musical quest

Siemen Terpstra

From the editor: Adding to the subject of symmetry in keyboard design, we can pass on the comments (made verbally to the editor) of San Francisco experimental keyboardist Chris Brown: Too much symmetry, he observed, can lead to a loss of identity of individual notes. A complete absence of symmetry, on the other hand, is inappropriate for an inherently symmetrical tuning system. His opinion was that the partial symmetry of the 8-4 Sohler Keyboard might be just about right -- given that we are working with 12-E.T.



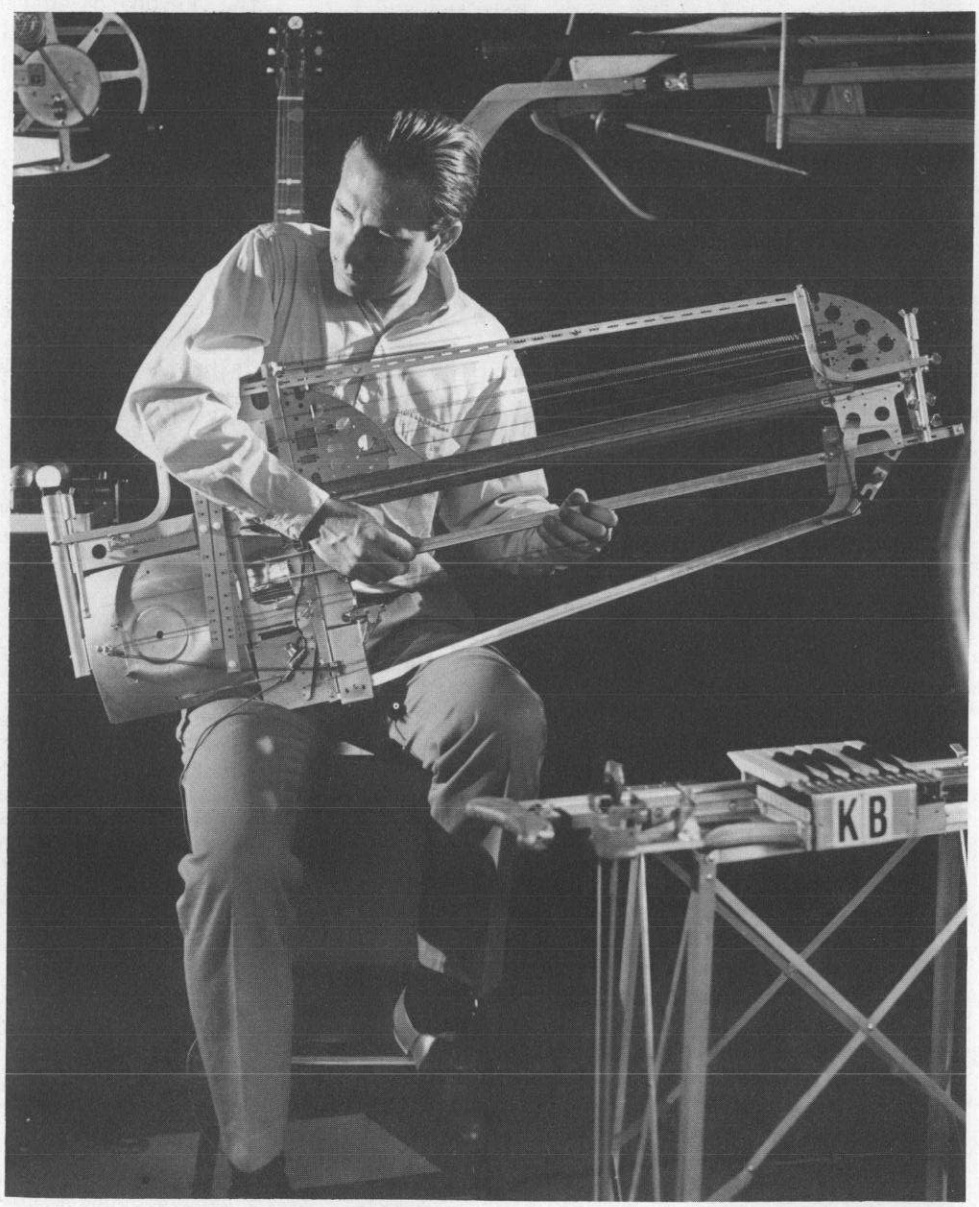
HYBRID INSTRUMENTS
Designed and built by Ken Butler

Ken Butler works in several artistic media, including sculpture, collage, film, light, sound, performance and, perhaps most importantly, ideas. With the latter element overarching, these disparate ingredients turn out to be not so disparate, and a coherent aesthetic emerges in the result. One of the central components in this amalgam has been his hybrid instruments. In this article we take a look, through photographs more than text, at several of these extraordinary fabrications.

Butler builds fully playable musical instruments (often simultaneously serving extra-musical functions as well) from man-made materials originally intended for other purposes. With some, like his axe/violin, the original materials are presented simply and directly. In more recent work, matters have become more complex: many diverse elements may comprise a single instrument. With this, the cultural identities of the separate components become less conspicuous, the visual message more multifaceted.

Butler has commented that the electric guitar is one of the most potent cultural icons of our time. The imagery is not lost, and most of his instruments use electric-guitar-like configurations, with strings, fingerable necks, and pick-ups. But the diversity of structural elements makes the guitar model a bit less explicit, creating instead some very eccentric and idiosyncratic results in both sculptural and musical effect.

Butler is joined by other musicians to play the hybrid instruments in performance. (They play other instruments as well. One of the musicians, Steve Wood, plays a Vibraband -- a lip-buzzed device made from dental dam rubber -- with extra-

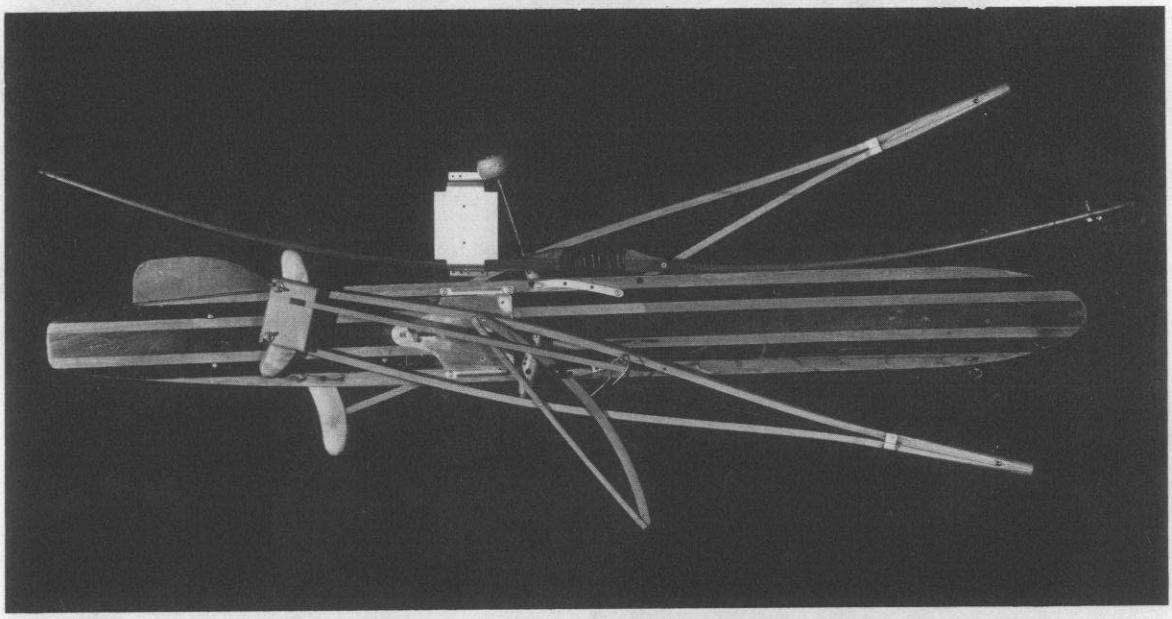


SHIP, played by Ken Butler. This instrument is made up of various metallic materials and objects put together with four necks and about twenty-five strings, many of which are springs. Reverb-like drones, metallic clangs, and grinding sounds are produced along with some more accessible guitar-like lines.

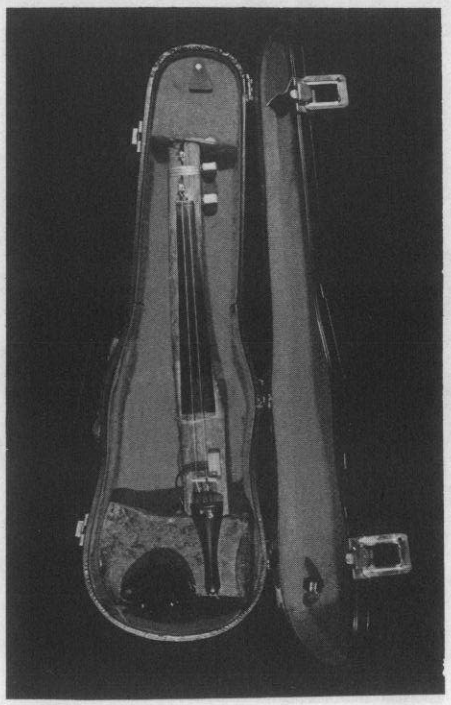
ordinary effect by all accounts.) The instruments are set in various C tunings, and played, according to critics, with skill and intelligence. The performances are big, multi-faceted affairs. The most recent performance piece is **Hybrid Antics.** Along with the hybrid instruments, it used kinetic sculptures, a set of projectors controlled in real time from a keyboard, pre-recorded tape, and a large-scale thematic structure that explores topics as diverse as insect morphology and man/machine relationships.

Observers sometimes comment on the eccentricity of Butler's work, but the emphasis is always on other attributes: the quality of the execution, both musical and sculptural; the provocative nature of the underlying themes; or the strangely optimistic interplay between control, chaos, chance and feedback. The photographs and descriptions presented here illustrate one dimension of those qualities.

For more information on the Hybrid Instruments, Ken Butler may be contacted at 1700 NW Marshal, Portland, OR, 97209. An exhibition catalog is available, produced in connection with a 1986 exhibition of Butler's work, entitled **Hybrid Visions.** It contains thirty-plus very clear photographs of the instruments, and an extremely well-written, thoughtful and probing text by Randal Bryan Davis. The catalog is available for $4 from Ken Butler at the address given above, and is highly recommended. In addition a video tape is currently available, and an audio tape is scheduled to appear next fall. Write for complete information.



WATER SKI: Constructed from a water ski, crutches, bow, and coat hanger, this one is played by holding it upright and striking the strings with a stick while bending them, much like a berimbau.

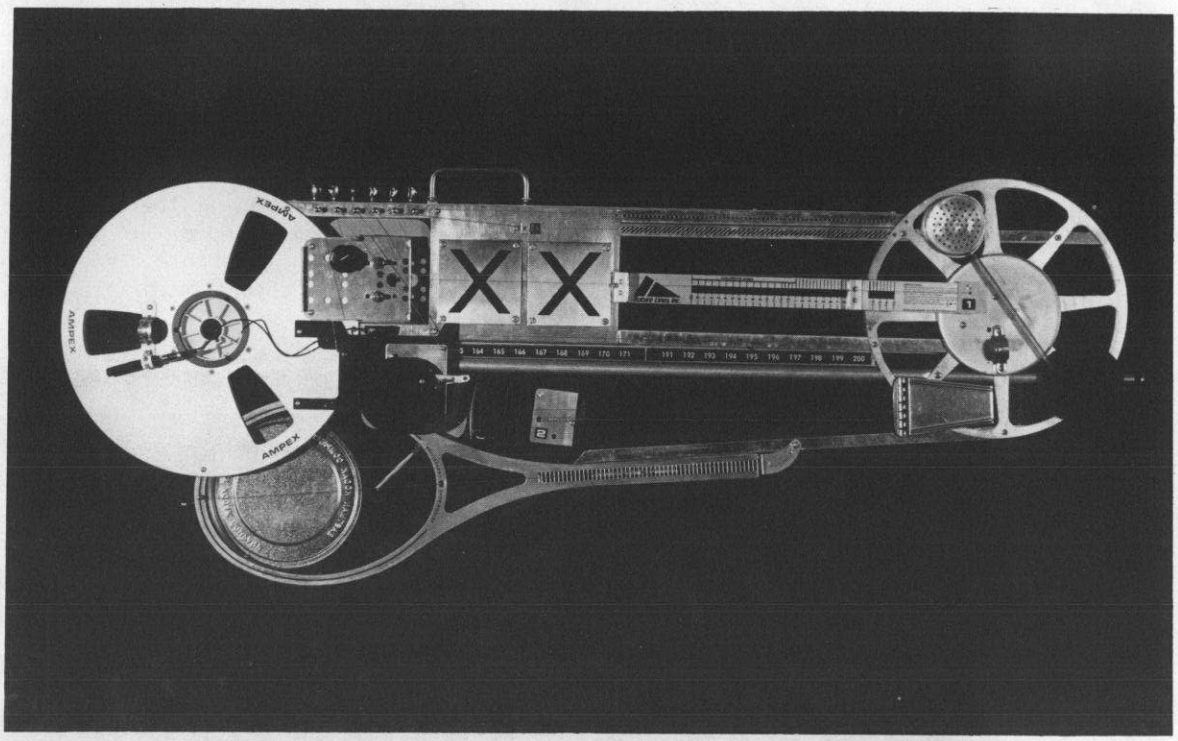


AXE/VIOLIN: This was the first instrument I constructed, from an old rusty hatchet found in my basement in 1976. It has two violin strings (C & G), and sounds very much like a violin, the mass of the blade adding lots of sustain. It is amplified with a Barcus-Berry transducer, as are all the hybrids.

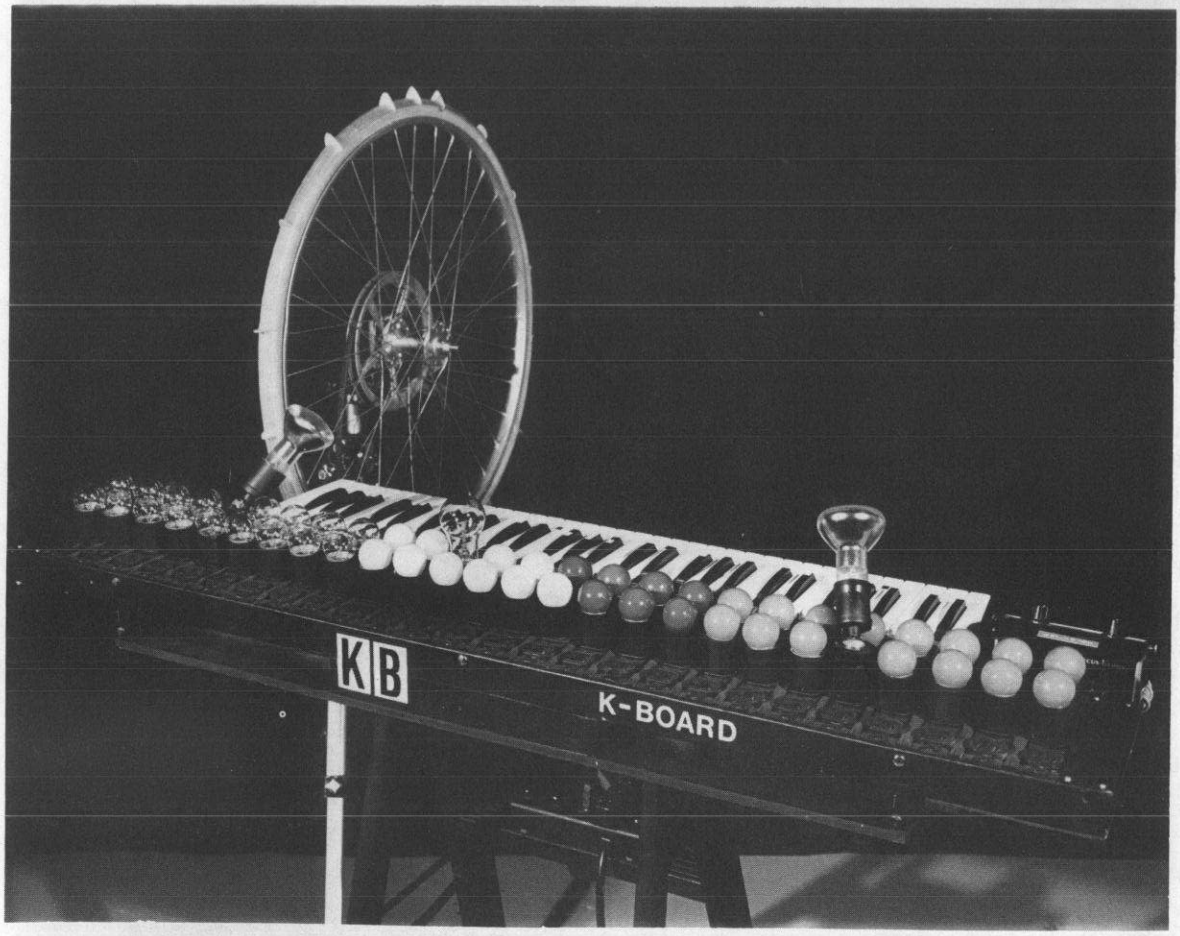
Pictured on the front cover, the BICYCLE WHEEL. Assembled from a 17" bicycle rim with an aluminum straightedge as the neck, there are four sets of double strings tuned in fourths. the bottom note is C. The spokes may be played as well, by plucking or striking, and they are tuned to a C scale.

The photographs on pages 7-8 were taken by Ken Butler, and he supplied the captions. The photo on page 6 was taken by Aaron Johanson.

Above: DOUBLE REEL. This one is principally constructed from an audio reel, film reel, and tennis racket. It has four necks, each with one or two strings tuned to G or C. They are sounded by various methods of plucking, strumming, scraping, etc., to generate metallic drones and melodic lines.



Below: K-BOARD. A bike wheel with guitar picks set in the tire plucks a string under the keys, which fret it when pressed, as they also turn on an electrical circuit (a light or appliance or ?). It sets up a rhythmic drone and allows for freedom from traditional scales when playing the keys.



THE EVOLVING NATURAL HISTORY OF THE WALL HARP
Article by Sylvia and Robert Chapman

This article on Wall Harps originally appeared in the December 1985 issue of **Folk Harp Journal.** After reading it I decided to try to speak to the authors to see about putting something about their wall harp in EMI. We contacted Nadine Bunn and Sylvia Fellows at the **Folk Harp Journal** to tell them what we had in mind and see if they could put us in touch with the Chapmans. It was discovered then that no address for the Chapmans could be found. The **Folk Harp Journal** people graciously suggested that we reprint the original article with their permission, and that is what we have done.

Folk Harp Journal consistently comes up with excellent articles of interest and value to instrument builders, and we thank the editors for the use of this one. For more information on their publication, the address is 4718 Maychelle Dr., Anaheim, CA 92807-3040.

We also offer very special thanks to Sylvia and Robert Chapman, wherever they may be.

Before moving on to the Chapman's article, I'll throw in a couple of interesting notes on the original one-string form of the wall harp, thanks to Paul Oliver in the **New Grove Dictionary of Musical Instruments.** It happens that it was played, bottleneck style, as a starter instrument by many who went on to become blues guitarists, including Big Joe Williams and Muddy Waters. One prominent figure in early rock and roll chose a stage name based upon one of the common terms used in the past for the instrument. That term was "Diddley Bow." I don't suppose I need to say who the rock and roll man was.

The Wall Harp was a one string instrument made and played by sharecroppers in the southern United States earlier in this century. They simply strung a wire on an outbuilding between two nails and shoved in a rock to give the string tension. A piece of metal was used as a movable "finger," pushed up and down along the string to stop it at different lengths and thus achieve different pitches. With little or no money, and few resources, these people of the land created and played a music we recognize as the blues.

A friend offered some welding wire and we do have a large uninsulated woodshed -- so we built a wall harp. A heavy wire on an eight foot soundboard is wonderfully sonorous. The word "harp" spurred us on. We added strings of random lengths until we ran out of wire after five strings. Five possible tones led to experiments with a pentatonic scale for us students of world music.

The way in which you set the string in motion gives much variety to the sound you produce. You can, of course, pluck it -- or if you choose, hammer it with a dowel. A dowel with a leather boot gives a very muted, soft tone. We have a giant psaltery when we bow it. No synthesizer ever sounded better than when we use metal or glass bottle slides on the strings. We could actually do the sound track for a science fiction movie or the next outer space thriller! Such a rich field for innovation these simple materials have provided.

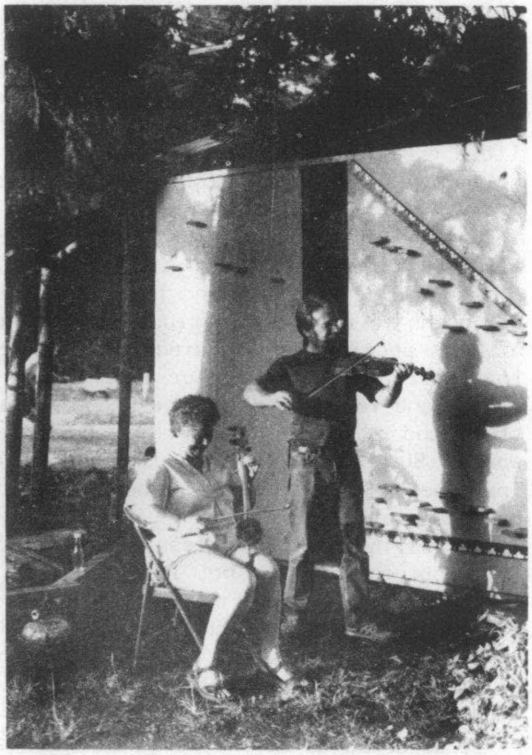
Five notes don't allow western music to be fully expressed, so we embarked upon a new project. We would build again using three different gauges of music wire and a greater number than five.

By using pine blocks as bridges and moving them up or down the strings, we are able to tune to the standard scales. We now have an instrument with unlimited possibilities. Ensembles now enter the picture. Our chamber group is planning a Sonata at Sunset for harp, cello and violin.

Since only two of the many four by eight foot panels of the shed are now in use, we could have a similarly tuned instrument for "Duet for Daisies and Dandelions at Dawn" (four hands). Harps in different keys could be at-the-ready all the way around the shed. We could combine jogging with an eighty-eight string "Harpano."

There is much joy in creating something from next-to-nothing, and great satisfaction in playing an instrument you have actually made. We owe much to the people whose work we have studied in the ethnomusicology texts and the present day practitioners of the folk instrument tradition.

KENT AND JEANNENE WILBY WITH THE WALL HARP



SLIDE WHISTLES
Built by Bart Hopkin and many others
Vigorously promoted and defended by Bart Hopkin
Article by Bart Hopkin

Somehow, some time ago, I came down with the idea that slide whistles are instruments of great unrealized potential. Most slide whistles have a husky, breathy tone that can be very appealing. Their continuously variable pitch makes them fine candidates for work with adventurous intonations, and opens the doors to a world of subtle colorations in vibrato, bends, and slides. Given the chance, they invite a very expressive approach to melody. But how often, I asked myself, have slide whistles been used in serious music? Their main purpose in life has seemed to be the accompaniment of falling objects in cartoons and free throws in basketball games.

So I got myself a commercially-made slide whistle.

As I commenced my exploration of the instrument, I realized one of the reasons why slide whistles are not used more frequently. It quickly became clear that learning to play it with accurate intonation was going to be a very, very time consuming task. The obvious comparison to make here is with the slide trombone: Facility in intonation is actually more difficult with the slide whistle than with the trombone, because the tolerances are a considerably finer. (The physical sliding distances are greater with the trombone, and because of the availability of the overtone series, allowing each slide position to serve for several pitches, those greater sliding distances need only cover half an octave. The slide whistle, meanwhile, must incorporate its entire range into eighteen inches or so of slide.) I did once speak with a trombonist who said that he had played slide whistles, and, with his ingrained sense of tuneful sliding, had found the intonation manageable. But most people are not already trombonists, and it seemed clear from my experience that playing the slide whistle well was going to require a serious commitment.

Now, people are occasionally willing to make that sort of commitment for instruments which are proven and recognized, have a known repertoire and style and a known position in an existing music world. But who will step forward to master an instrument whose capacities and rewards have never been demonstrated?

As for myself, regardless of the reputation of the instrument, I was not in a position to devote the necessary time to a new project of magnitude comparable to learning an orchestral instrument.

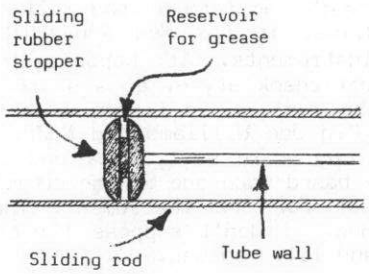
So I was frustrated. Here I was with a vision of great possibilities, but I was not in a position to realize them.

It occurred to me then that the task of mastering the slide whistle could be made far easier if there were some way of marking visually where to find each pitch. If the player could somehow see how far to extend the slide to produce a desired tone, the searching and guess work would be gone.

THE ALTO SLIDE WHISTLE, CALIBRATED

Before explaining how I set about making this possible, perhaps I should take a moment to describe a typical mass-produced slide whistle so we know what we're talking about.

Most commercial slide whistles are fipple flutes -- that is, they employ a recorder-style mouthpiece which sets up the vibration in the tube by directing the airstream against a cutaway edge. They are cylindrical, since the bore must be of uniform diameter to accommodate the stopper. The sliding handle, which usually is a metal rod, runs through a hole drilled in an end block at the far end of the tube. Attached to the inside end of that rod is the rubber stopper, made airtight by its snug fit and some grease applied around the edges. The grease also helps it slide easily.



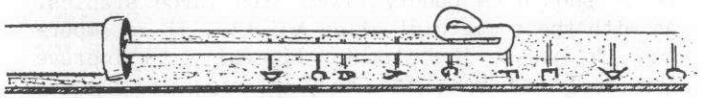
Sliding the slide, and with it the stopper, naturally varies the vibrating length of the enclosed air column, and, as a result, the sounding pitch. The presence of the stopper means that the slide whistle operates as a closed tube resonating system, producing a pitch approximately one octave lower than the equivalent open tube vibrating length. (A recorder, for instance, with its open end or open tone holes, has a range an octave higher than a comparably-sized slide whistle.)

Slide whistles are not always easy to find; not all music stores have them and some designed as children's toys are not satisfactory. The brand I got, once described to me as "the Cadillac of slide whistles", was American Standard, made from a cylindrical tube of chrome plated steel. This make is dependable and nice looking, and has a clear tone over two-plus octaves starting at D below middle C. It is available at some music stores, and from mail order educational music supply houses such as Interstate Music Supply (PO Box 315, New Berlin, WI 53151) for about $8.

I found that on my particular slide whistle the action was a bit stiff, making subtle movement such as vibrato difficult. I remedied this by removing the end plug and pulling out the slide and stopper. I cleaned the grease from the stopper, then judiciously sanded it down. I then built it back up slowly with coats of silicon

spray, testing frequently for a snug fit, good tone and easy sliding. When the fit seemed ideal, I re-greased it and reassembled everything.

OK, back to my plan for an easier-to-play slide whistle: To create a visual system for slide positioning, I began by preparing a stick of wood a little longer than the length of the whole instrument with the slide at its farthest extension. I affixed the stick to the bottom of the body of the whistle, so that the slide extended along the stick, stopping just short of its end. My idea was to calibrate the stick, marking the point to which the slide must be moved to produce each note.



But there was a problem. If you can picture me trying to play the modified instrument, you'll see that holding the whistle in blowing position put the whole assembly in such an orientation that it was impossible to see the calibration stick, let alone mark it for the pitches.

To make it possible to reposition the whistle during playing so that the calibration stick could serve its purpose, I attached a flexible plastic blowing tube of about two feet long to the mouthpiece of the whistle. This was to allow the player to orient the whistle however he wishes while blowing through the tube and into the whistle.

With tube attached, I set the whistle and calibration stick on a table in front of me, took the blowing tube in my mouth, and, working by ear, began informally marking off the pitch locations on the stick. Holding the instrument on the table, I found, made it possible to brace the hand operating the slide against the table top for greater control and precision.

And, Lo! with this job done, I found that I had instantaneously become a respectable slide whistle player. Slower melodies could be negotiated without the creepy searching for pitch, reminiscent of third rate lounge singers, that had characterized my earlier efforts. A little time and practice quickly brought me more fluency with faster melodies, and I was on my way.

And so you see, there may be another route to Carnegie Hall, after all.

The characteristic husky tone remained in the modified instrument, of course, and with it a very expressive sensitivity to changes in breath pressure. I found as I became more fluent with it that, between the great flexibility in pitch and this sensitivity of timbre, the slide whistle takes on some of the emotional quality of the human voice. In fact, while it might not ever be mistaken for a voice, the immediacy of emotional content that we associate with the voice can be almost disconcertingly present. After working with the instrument for some time now, I've found that it is at its best when it is allowed to stretch out in spacious solos. Pairs or trios of slide whistles used like a horn section have proven to be highly effective in a very peculiar way, with a wonderfully close blend and a completely unique, voice-like timbre. Slide whistles do not work well in contrapuntal music or in passages requiring pronounced rhythmic definition, since the articulation tends to be a bit amorphous.

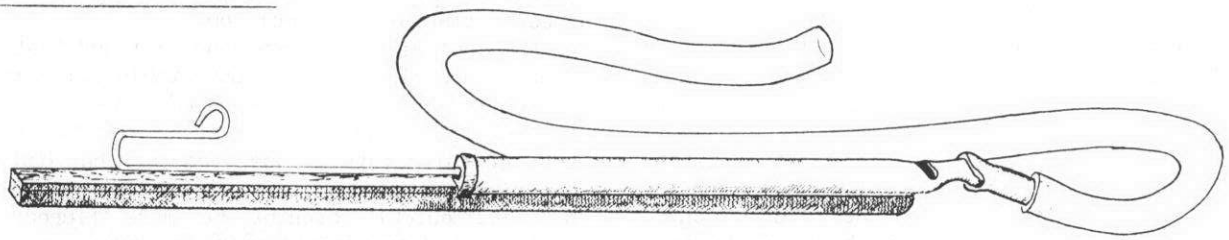
At this point I should back track and say a few words about construction and materials.

Permanently attaching the calibration stick to the ready-made metal slide whistle has been a problem. There are some highly touted glues on the market, but I have not found the one that satisfactorily works in this situation to bond the chrome to the wood. My inclination, if I were to do the job over, would be to find some attractive, decorative way of tying the two together -- done tastefully, with perhaps some macrame technique, it could be both functional and very pretty.

Flexible plastic tubing for the blow tube is widely available in many sizes and varieties in hardware stores. I found that narrow tubing -- less than 3/8" or so -- restricts air flow, increases friction and generally makes blowing difficult. Larger tubing -- more than about 5/8" -- can be awkwardly rigid and also clumsy to hold in the mouth. Clear tubing has the undesirable characteristic that it reveals the amazingly large amount of saliva and condensation that is a natural part of playing any wind instrument.

The round tubing will not readily close over the flattened mouthpiece of the whistle. To mediate between them I used a piece of copper tubing about three inches long, which fit snugly into the end of the plastic tube. The other side of the copper segment I bent and cut to fit fairly closely over the mouth of the whistle, and sealed it there with epoxy glue. In truth this arrange-

The store-bought alto slide whistle, modified.



ment has never proved satisfactory since the glue has not held all that well, and I'm sure a better arrangement could be found.

THE BARITONE SLIDE WHISTLE

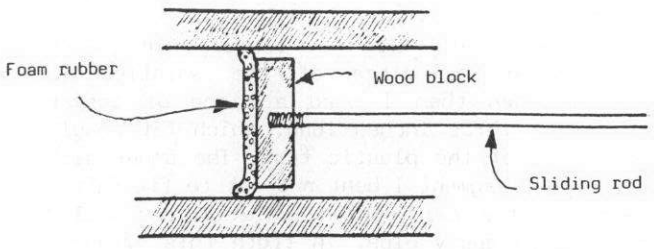
The results of my explorations with the modified store-bought slide whistle were exciting enough to make me want to build another one.

My plan was to build a bigger one, both to extend the range and because I had an idea that the timbral quality of the instrument might be quite effective in a lower register. Also I like the idea of slip-sliding in the bass. The decision to make a lower-pitched calibrated slide whistle meant, of course, that I would have to build from scratch, since nothing of the sort would be commercially available.

After some false starts, I came up with the instrument shown in the photograph. The whistle itself is a fipple pipe, made like a wooden organ pipe, more or less square in cross section. It is just under three feet long, made of mahogany and white pine.

The calibration stick is a piece of mahogany about four inches wide and a little over six feet long, bolted to the back of the whistle. Directly under where the slide moves there is a strip of white pine, where the pitch locations could have been marked. Rather than marking them there permanently, though, I glued on several patches of velcro. This allows me to make up pitch location charts on strips of stiff cardboard, attach complementary velcro to them, and fix them interchangeably on the calibration stick. The cardboard strips can be made colorful and pretty -- it's fun.

The slide is 3/16" steel rod, looped at the outside end to form a handle. At the inside end it is threaded into a block of wood slightly smaller than the inside of the square pipe. That block is the foundation of the sliding stopper. Strips of dense foam rubber are affixed to it, making a plug a little bigger than the interior of the pipe for an air tight fit.



Dense foam rubber weather stripping works well for this purpose, but its adhesive backing will give out over time with exposure to moisture and oil, so it should be doubly fixed with large staples. As with the commercial slide whistle, it is important to grease the stopper liberally to improve the seal and make for easy sliding. Since the wooden interior walls of the pipe drink up the oil quickly, it helps to amply re-grease frequently (perhaps it would have been beneficial to varnish the interior walls before finally gluing the pipe together, to make them less thirsty).

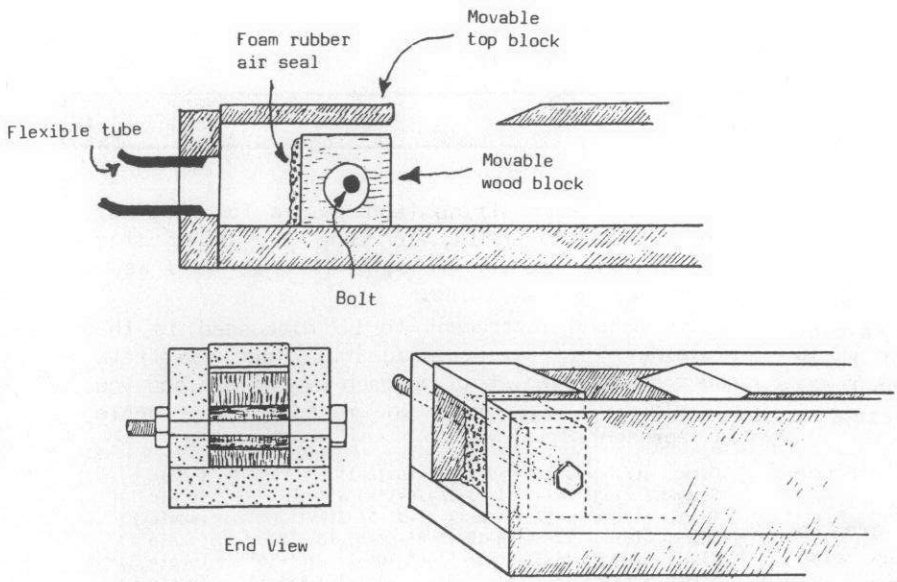
Even with grease on the stopper and along the interior walls the seal can be problematic. If there is any air leakage around the stopper (or anywhere else in the pipe) the instrument won't speak. This problem is especially pronounced with the low pitches, where the relative positions of the slide, end block and stopper can easily throw off the alignment.

The easy solution to this problem is to make the stopper, with its foam gasket, considerably larger than the interior of the whistle for a very tight fit. This has the disadvantage, though, of making for a stiff slide and a lot of sliding noise when it moves. Fortunately there is some acceptable middle ground between the large, too-tight stopper and the small, leaky stopper, which can be found with a little experimentation.

The tricky part in making any fipple instrument is finding the optimal arrangement of the fipple and edge for producing the clearest tone and largest sounding range. Slight adjustments to the angle of the air striking the edge, the thickness of the air passageway, and other variables have a major effect on timbre and range, and indeed on the instrument's ability to speak at all. The problem is greater for a slide whistle than a single organ pipe, since with an organ pipe the builder can seek out the perfect arrangement for the one intended pitch, while with a slide whistle one must find a compromise setting which produces acceptable results over a large range.

To make this problem more tractable, I gave the baritone slide whistle an adjustable fipple (see the diagram for details).

Even with the convenience of this adjusting system, getting the instrument to speak over a



ADJUSTABLE FIPPLE FOR THE BARITONE SLIDE WHISTLE: Air coming into the pipe from the blowing tube enters the antechamber. The rear wall of this chamber is formed by a block of wood fit snugly into the square pipe. The fipple itself (the narrow passageway which concentrates and directs the air stream) is formed by the top of this block and the top and sides of the wooden pipe. The block and the top piece above it are not permanently fixed in place, but are held there by the sides of the pipe. A bolt passes through holes in the sides and an oversized hole in the block, so that when the nut on this bolt is tightened, it squeezes the sides against the block and top piece to hold them in position. When the nut is loosened, their positions can be adjusted, which has the effect of altering the size, shape and angle of the fipple.

large range was a problem. The theoretical lowest available tone on the baritone slide whistle (the pitch that should sound with the slide at full extension) was around F an octave and a half below middle C; at the other extreme the length of the air column could be reduced to zero. Initially, the instrument only wanted to speak over about a 5th or 6th, starting well above that F. With a lot of experimentation with the fipple and some improvements in the stopper seal, along with lots of 3-in-1 oil, I managed to increase the range to about an octave and a 5th, starting (on a good day) with the G an octave and a half below middle C and fuzzing out somewhere around the D, E or F above.

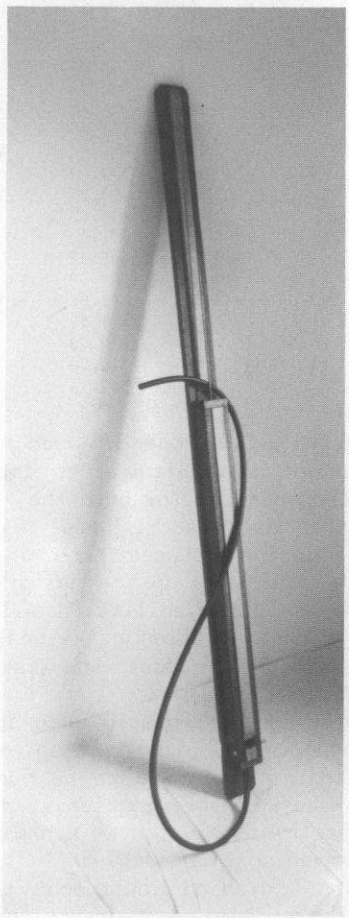
With the calibration stick attached the baritone slide whistle is over six feet long. Laying it on a table like the alto slide whistle is awkward, so it is played upright, like a string bass. The player's left hand holds it erect while the right operates the slide. The blowing tube runs from the player's mouth to the air intake hole at the base of the whistle. This means that the tube must be fairly long -- five or six feet -- and accordingly must be fairly large diameter to minimize resistance.

Because of the larger sliding distances involved, the baritone slide whistle is easier to play in tune than the smaller alto. The stopper produces a sound as it moves within the wooden pipe -- a sliding tone corresponding in pitch to the changing vibrating length of the enclosed air. This sound could be regarded as a flaw in the instrument, but, personally, I love it. Coming before and after tones as it often does, it reminds me of a singer's breathing, but it possesses at the same time a rather exotic quality.

The top part of the instrument's range is very breathy and hooty; the middle is rich, full and moderately loud; the bottom has a satisfying tone but lacks volume. At its best the baritone has the satisfying, room-filling resonance of a foghorn without depending on volume for the effect.

The playing action of the larger instrument is a bit slow, and the tone ponderous. It definitely does not lend itself well to sprightly passages. It also requires a great deal of wind, making long sustained lines difficult to maintain. Given some space, though, the instrument is capable of a grave sort of lyric beauty that is duplicated by no other instrument.

For more information on the calibrated slide whistles described here, you can contact Bart Hopkin at EMI's address, PO Box 784, Nicasio, CA, 94946.



THE BARITONE SLIDE WHISTLE

KAYENIAN MUSICAL INSTRUMENTS

Article by H. Barnard

The Kayenian Imperium is an imaginary country consisting of twelve lands gathered around Kayolonia and its capital Kaycity. In spite of their nonexistence the Kayenians (nowadays about 22 million of them) built, in about 2500 years, a rich and interesting culture.

An important part of a culture always is the music. From our point of view, we can call Kayenian instruments "experimental", as they are so different from our own. (Of course there are also instruments which are experimental within the Imperium, of which I will speak later).

The most striking aspect of Kayenian music is the tuning: 19 tones per octave and just intonated. This tuning was invented in the Kayenian Imperium by Wayt Shoureek in 1191 (Kayenian date). Hanook Zeep built a keyboard for this tuning in 1223. It rapidly conquered the Imperium.

Tone	R A T I O Fraction	Cents	Cycles per Sec.	Status
1	1/1	0	276.48	main-tone
2	128/125	41	283.12	lowered 3
3	16/15	112	294.91	side-tone
4	9/8	204	311.04	raised 3
5	75/64	275	324.00	main-tone
6	6/5	316	331.78	lowered 7
7	5/4	386	345.60	side-tone
8	32/35	427	353.89	raised 7
9	4/3	498	368.64	main-tone
10	512/375	539	377.49	lowered 11
11	64/45	610	393.22	raised 10
12	3/2	702	414.72	maintone
13	25/16	773	432.00	lowered 14
14	8/5	814	442.37	side-tone
15	5/3	884	460.80	raised 14
16	128/75	925	471.86	main-tone
17	16/9	996	491.52	lowered 18
18	15/8	1088	518.40	side-tone
19	125/64	1159	540.00	raised 18
1'	2/1	1200	552.96	main-tone

The status of a tone is used to distinguish more important tones from less important tones. This has consequences for both the keyboard layout and the notation system. Note that there is a side-tone missing between tone 9 and tone 12: this asymmetry breaks up the uniformity and gives the system its surveyability. I will not go into detail of either notation or keyboard, but I will tell you something about the Kayenian musical instruments.

Of course it is impossible to import anything from a nonexisting country, so our models of Kayenian instruments have to be built here. This naturally causes hybridization. Fortunately many drawings are available, so we can make the instruments as Kayenian as possible.

The first Kayenian instrument that was built here was the streemo, a four-stringed instrument. The first three strings are tuned in unison and an octave (1-1'-1), and under them are frets -- one for each tone. The fourth string is tuned a fifth above the lowest string (and thus a fourth under the highest) resulting in tone 12. Under this string there are no frets, and it is used as a bourdon or to play solos.

The second instrument to be discussed is the pluiging. This six-stringed instrument has frets under each string, but: on each of the strings you can play one scale only. The most important scale is represented twice:

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First  string: 1-3-5-7-9-12-14-16-18-1'            (scale F)
Second string: 5-7-9-11-13-16-18-1'-3'-5'          (scale T)
Third  string: 9-11-13-15-17-1'-3'-5'-7'-9'        (scale P)
Fourth string: 12-14-16-18-1'-4'-6'-8'-10'-12'     (scale Z)
Fifth  string: 16-18-1'-3'-5'-8'-10'-12'-14'-16'   (scale S)
Sixth  string: 1'-3'-5'-7'-9'-12'-14'-16'-18'-1''  (scale F)
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Note that in the five scales all tones are present except tone 2 and tone 19: they are somewhat "strangers" within the Kayenian Music.

THE CREATION OF THE KAYENIAN IMPERIUM

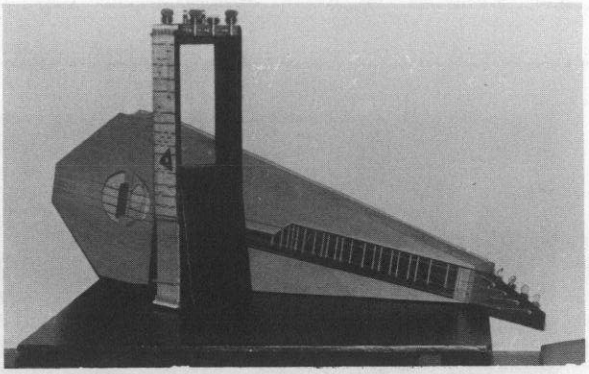
In August 1971 two boys went, by ferry, from the island Texel to the mainland. It was the first time they had gone to school in Dan Helder on the mainland, where they would go for six years. On their daily trip of about a quarter of an hour, they got bored and transformed the new things they were learning into an imaginary country. It was a hobby that would soon turn into an obsession.

These boys were Jan Kok (born 1959 at Texel, now living in Amsterdam, being a graduated but unemployed historian) and Hans Barnard (born 1959 at Leyden, now living in Amsterdam being a medical student).

Soon they were joined by Hans' brother Wilhemus (born 1960 at Leyden, now living in Texel being a cook and organizer of cultural happenings). The three of them put up a foundation in 1981 to secure the interests of the country they created and still create. They called this foundation VvK, which is short for Friends of Kayolonia (address: Kotterstraat 22/24; 1794 BE Oosterend-Texel; the Netherlands).

The Kayenian Imperium consists of twelve countries gathered around Kayolonia and its capital, Kaycity. It is about 2.1 million sq.km. and has 22.5 million inhabitants. The main factor in keeping all these peoples and cultures together in the Conclusist Church, the only church within the Imperium that unifies all religious and philosophical streams.

The level of technology in the Imperium is quite low (a telephone is the most complicated instrument) but the cultural level is high. It is this part of the Kayenian society that is best worked out by the creators, who always welcome new ideas.

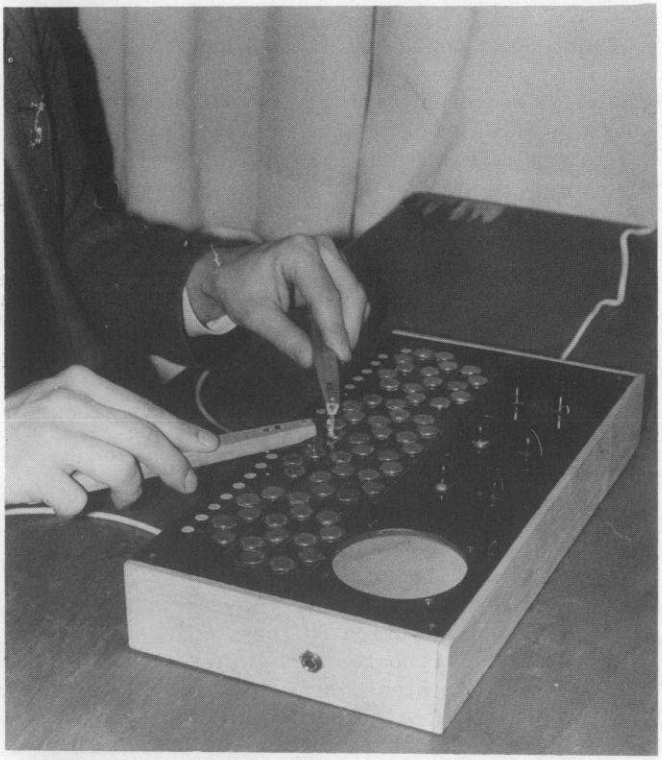


STREEMO & PLUIGING
Photo by W.Z. Wendrich

A very good example of a hybrid is the abrool. This bowed instrument has two necks connected by a boat-shaped body. The neck that goes up carries three pairs of strings tuned in fourths; the neck that rests of the floor carries twelve sympathetic strings (on real Kayenian instruments there are twenty sympathetic strings, of course). The instrument is decorated with a typical abrool-rosette, shaped like a sun with nine beams.

On November 15, 1986 Mr. L. van Assendelft presented the prototype of a Kayenian electronic organ to the VvK foundation (this is the foundation that looks after the interests and finances of the Kayenian Imperium and its creators; VvK stands for Friends of Kayolonia). The instrument is called Levias. It is a monophonic instrument, producing Kayenian tones when you close the circuit by touching a metal key with one of the two playing sticks.

THE ABROOL
Photo by W.Z. Wendrich



LEVIAS
Photo by W.Z. Wendrich

Of course there are also people in the Kayenian Imperium working on experimental musical instruments. I made a hybrid model of one of these instruments for a friend of mine (who is into free jazz). This instrument, the matzaar, was invented by W. Intooseel (grandfather of the famous Kayenian composer). He made it acoustic, while I built an electric version.

The matzaar has twelve frets within the octave. They are not tuned according to any scale but divided evenly along the neck of the instrument. The more important flageolot-tones lie above a fret, but for the rest it will never be possible to play pure intervals (which, of course, was never intended).

In this article I have given some highlights of Kayenian music. We do not know what the future will bring us (though there are advanced plans to build a Kayenian clavichord). If you want to participate in that future or have any questions or remarks, please write:

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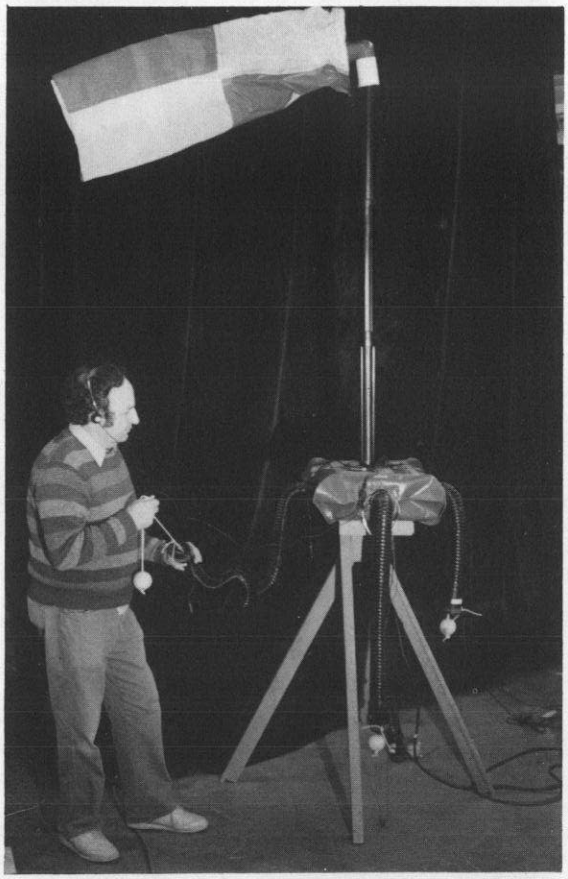
"WIND SUCK", A SOUND SCULPTURE

Designed and built by
Yehuda Yannay and Stephen Pevnick
Article by Yehuda Yannay and Stephen Pevnick



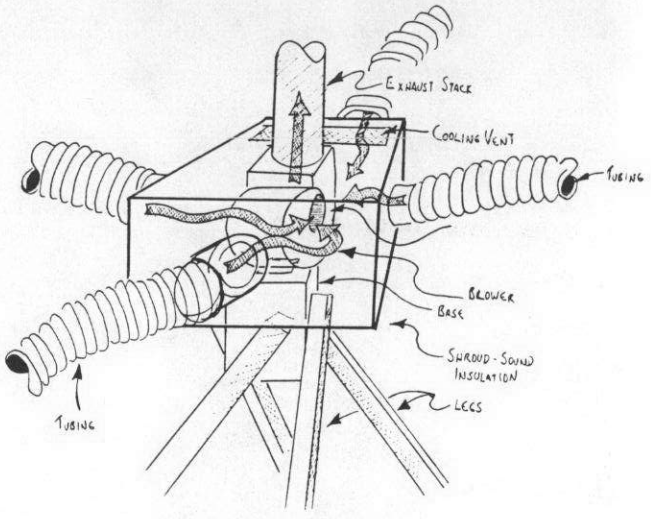
"Wind Suck" was first thought out in the spring of 1985 by Stephen Pevnick, an artist, and Yehuda Yannay, a composer, both of the University of Wisconsin - Milwaukee. We joined together to design an interactive musical instrument that could be displayed at the Milwaukee Art Museum. The research evolved around flowing air resonance in tubes of various lengths and materials with electronic amplification and different electrical-mechanical wind propulsion systems. We were also looking for a way in which the sculpture would change its sound in response to viewer interaction.

We first explored a number of rigid tubes of various materials with a sliding piston element. First we tried to attach a microphone to the sliding element and then in different places along the tube. The largest of the tubes were about 20 feet long and 5 inches in diameter. We discovered that it was not very practical to interact with an instrument of this size. At the end we found out that an elegant solution to the problem is the use of flexible corrugated polyvinyl tubing. The tubing can be stretched or compressed to vary its length, eliminating the need for the piston.

We tried using an electrical-mechanical blower to push air through the tubing, but the resulting sound was masked by the noise of the blower. Using the air intake side of the blower to suck the air through proved to be a more effective arrangement and produced the richest sound in the tubes. We drilled holes in the plastic tubing and inserted a lapel microphone at different places along the tube to explore possibilities which would yield the clearest range of overtones. We sampled the sound with a digital frequency analyzer to verify the presence of the overtone spectrum.

After experimenting with these variables we came up with an overall design. It was a symmetrical design built around a 1/8 horsepower, motor-driven rotating drum blower enclosed by a shroud for sound proofing. To the enclosure we attached four pieces of flexible tubing of varying length. The largest is 6 feet long; the shortest 18 inches. The tips of the tubing at the open end have molded hard plastic fittings used for industrial vacuum cleaners and have a 360 degree rotating neck which adds to the easy manipulation of the tubes. Individual microphones are attached just inside the mouth of the air intake of each of the four flexible tubes.

A nylon braided cord runs through the tubes and connects to the central shroud internally. People can manipulate one of the tentacles of the sculpture by holding the nylon cord taut in one hand and sliding the flexible tubing along it. As the tube retracts or extends, the fundamental of the sound changes, and in effect the person plays a large sliding pennywhistle. Because of the symmetrical arrangement of the tubes, people can play this in an ensemble.



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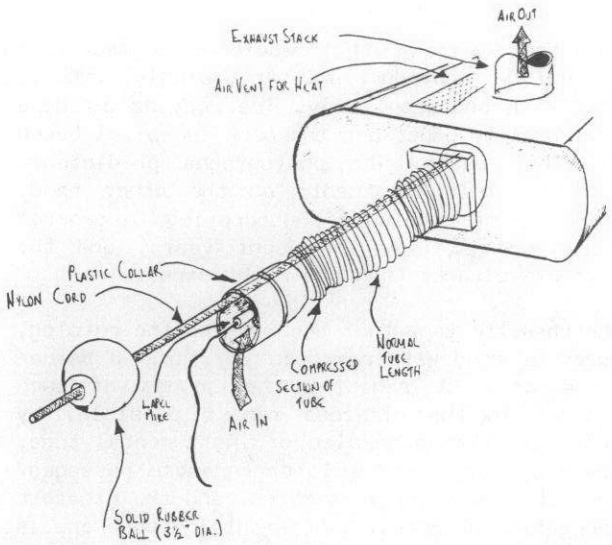

A rigid vertical tube attached to the central shroud containing the blower serves as an exhaust. It takes the exhaust noise away from the listener and makes the constant drone sound of the blower richer. It also allowed us to attach the wind sock to the top of the sculpture, justifying its title, "Wind Suck".

For its first showing, in June of 1985 at the Milwaukee Art Museum, we used speakers positioned 20 feet away from the sculpture. In a subsequent installation at a small gallery show, we chose a more intimate realization of the idea by using four ear phones at each of the four tubes.

Financial support for the project was provided by Milwaukee Artists Foundation. For more information contact the authors at the School of Fine Arts, the University of Wisconsin - Milwaukee, P.O. Box 413, Milwaukee, WI 53201.

ORGANIZATIONS AND PERIODICALS

Experimental Musical Instruments regularly reports on organizations and periodicals of potential interest to its readers. In this issue we look at an organization which deals with the practical issues of instrument mechanics more directly than any other.

THE NATIONAL ASSOCIATION OF PROFESSIONAL BAND INSTRUMENT REPAIR TECHNICIANS

Musical instrument repair, according to tradition, has been a somewhat individualistic and secretive profession. Experienced repairmen have been suspected of having a tendency to keep their tricks to themselves, and sharing information unwillingly. The founders of the National Association of Band Instrument Repair Technicians believed that that needn't be the case. In 1976 they created the band instrument repairman's professional organization to facilitate development of professional skills and the free dissemination of information in the field. Despite some pessimistic predictions in those early days, NAPBIRT is now firmly established, has grown to over 800 members, and is unquestionably fulfilling its purpose.

NAPBIRT's most prominent activities are an annual convention and the publication of its newsletter, **Technicom**.

The 1987 convention was "Technical Spectrum '87," held in Kansas City in April; next year's will be in Delavan, Wisconsin. The conventions feature clinics presented by master clinicians from various segments of the repair community and the instrument manufacturing industry. There are also opportunities for informal exchange of information.

Technicom is a sixteen-page newsletter appearing six times a year, edited by Tom Chekouras. It is a treasure chest of practical technical information the likes of which will be found nowhere else, from the longer articles treating a particular subject in some depth, to the one paragraph "Hints form Heloise" style fillers sharing shop tips of all sorts. There are also pieces devoted to the business side of the profession, and, occasionally, interesting or funny tidbits not specifically concerned with instruments. A more or less random sampling of articles from recent issues includes "Patching Bassoon Bocals," "Trumpet Valve Repair," "Heat Treating -- Know the Steel First," "Contract Dispute," and "A Lesson in Customer Relations." Several other articles more specifically related to new instrument building have been cited in EMI's "Recent Articles Appearing in Other Periodicals" section in the past.

Another aspect of **Technicom**, and, indeed of NAPBIRT in general, is that it provides a strong connection with the band instrument manufacturing industry. In the world of plucked and bowed strings, percussion, and especially new instruments, there is still lots of room for the individual maker. But with brass and orchestral woodwinds the market is (for good reason, perhaps) dominated by larger manufacturers. Through articles and advertisements, **Technicom** makes these companies, their products and their technology more accessible to the individual craftsperson.

It's worth noting that the areas in which **Technicom** and NAPBIRT are strongest are those in which some experimental instrument builders are weakest. Many new instrument builders are at home with wood but lack the tools and skills for metal work; NAPBIRT devotes much of its attention to metal. The tendency among new instrument builders is to emphasize strings, idiophones and flutes without keys; NAPBIRT is strong on lip-buzzed instruments, reed instruments and orchestral flutes.

Full membership in NAPBIRT is open to professional repair technicians for $60/year. Associate membership, available to anyone not qualifying as a professional repair technician, is also $60/year, and student membership is $30/year. For more information write National Association of Professional Band Instrument Repair Technicians, PO Box 51, Normal, IL 61761; (309) 452-4257.

BOOKS & RECORDINGS

Some of the best sources for documentation on new instruments are exhibit catalogs from showings of musical instruments and sound sculpture. With this review EMI continues an ongoing series highlighting a few of the most interesting catalogs available.

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MAKING MUSIC: CONTEMPORARY MUSICAL INSTRUMENTS AND SOUNDS CRAFTED IN CALIFORNIA

Exhibit catalog and accompanying cassette tape for the **Making Music** exhibit at the California Crafts Museum in San Francisco, February 6 through April 7, 1987. Exhibit curated by Bill Mellentin; catalog book produced by Carol Mellentin, with photographs by John Werner, VLASTA and others; catalog tape produced by Rand Wetherwax.

Available from W.L. Mellentin, PO Box 1119, Menlo Park, CA 94026. Include payment of $24 in U.S. funds (taxes, handling and shipping included).

This spring's **Making Music** exhibit was an ambitious project, with twenty-eight California builders showing over fifty instruments. The exhibit has given rise, in turn, to an ambitious catalog. It documents the instruments and builders with ninety pages of text and photographs. Accompanying it is a forty-five minute cassette featuring samples from most of the instruments.

The book contains an introduction by the show's curator, Bill Mellentin, followed by anywhere from one to seven pages on each of the builders whose work was exhibited. The introduction describes some of the thinking behind the exhibit, and a bit about the process of its creation. Sound art exhibits always raise a lot of questions and present some challenges, and Bill Mellentin's thoughts on the subject after something of a baptism by fire are welcome and interesting.

The pages devoted to each artist were for the most part written by the artists themselves. In cases where artists' accounts were not available, the notes were written or gathered from various sources by editor Carol Mellentin. Not surprisingly, the builders' pages are diverse in style, reflecting the personalities that produced them, but they are fairly consistent in content. Most do a good job of describing the instruments in reasonably concrete terms. In many cases they say something about the thinking behind the instrument and the circumstances of its creation. Brief biographical notes on the builders are also included.

More than half the book is given over to photographs. Some were provided by the artists; others are new photos taken specifically for the catalog. They are generally explicit, complete and detailed, and, thankfully, liberally sized.

The economics of production in small quantities has made it impossible for the California Crafts Museum to print such an extensive catalog by the photo-offset methods that would have made for high quality reproduction. Accordingly, it is available in photocopy only. The copying is done on high quality paper and the book is spiral bound in a clear cover. The photographs predictably suffer from this treatment; on the other hand, the quality of available photocopying in general has been on the rise in recent years, and the results are clearer than one might expect.

The cassette tape that accompanies the catalog, produced by Rand Wetherwax, is in itself a valuable document. It exhibits the sounds of each instrument in the clearest manner possible, by presenting isolated samples of instrumental tone, followed by very short solo or ensemble passages. The result is a study in timbres, and the clearest documentation of actual instrumental sounds one is likely to find anywhere. The only complaint here might be that, as so often happens with cassettes, it is sometimes difficult to make the connection between the liner notes and the sounds, and figure out just what is being heard at a given moment.

A few of the original recordings appearing on the tape came from the builders or other outside sources, and these vary quite a bit in quality. In particular, the Harry Partch recording (of a portion of Jabberwocky: "His vorpal blade went snicker-snatch!") is all pie tins and sand paper sound. The majority of the instruments, on the other hand, were recorded specifically for this tape, under excellent conditions and with the best of equipment. The builders and instruments were brought into a San Francisco recording studio for digital recording (it was quite a parade passing through the studio doors, you can imagine). The resulting tapes were edited using a Fairlight Series III sampling computer. In the final dubbing onto cassettes for sale, the line of cassettes normally used for large quantity reproduction were set aside in favor of the audibly far superior top-of-the-line product normally sold as blank tapes to consumers.

All of this makes a difference. The reproduction quality on the whole is top notch, and for most of the instruments, the cassette really shows off sound for sound's sake.

In sum, **Making Music**, the written catalog and the cassette, documents a lot of material that you simply will not find elsewhere. In a field where documentation generally runs short, it is highly recommended.

A list of the builders appearing in the catalog follows:

Bob Bates, Chris Brown, William Colvig, Joan Bell Cowan, Ivor Darreg, Darrell De Vore, Ronnie Engel, Peter Engelhart, Cris Forster, Scott Hackleman, Mickey Hart, Brett Cohen, Jim Loveless, Danny Orlando, Willy John Cashman, Bart Hopkin, Tom Nunn, Other Music, Nazim Ozel, Harry Partch, Susan Rawcliffe, Prent Rodgers, Sharon Rowell, Daniel Schmidt, Leon Schneiderman, Stephen Smith, Richard Waters, Erv Wilson.

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article topics to pursue; and we hope those suggestions will keep coming. Remember, too, that individuals can communicate with the readership as a whole through the notices column. EMI prints notices of up to forty words from subscribers free of charge.

Several months ago EMI released its first cassette tape, representing instruments that had been featured in the newsletter during its first year of publication. With our second year now complete, we are compiling a second tape, to be called From the Pages of Experimental Musical Instruments, Volume II. We have most of the recordings in hand already, and it includes some great stuff. Like the material on Volume I, it is at times beautiful, at times outrageous, always both musical and documentary. The new tape will become available in two months, at the time of the August issue. The price will be $6 for subscribers ($8.50 for others), which includes postage and handling.

EMI'S FINANCIAL HEALTH

As we move into our third year, EMI's circulation still falls somewhat short of that of **Time Magazine**, but our financial health is stable. Start up costs in establishing the newsletter have not been paid off, but current obligations are being met. Renewal rates have been very good (which says something about the quality of the publication). The rate of new subscriptions has dropped off as compared to our first year, in part because less concentrated promotional effort was made in the second year. (Plans to bring EMI to the attention of more potential subscribers are now afoot once again.) Total subscribership continues to rise, albeit slowly, and stands a little below three hundred at present. In addition to that, we sell a healthy number of back issues. The recently released tape has sold enough to cover costs and a little more, and a trickle of orders continues to come in.

In total, this is a sustainable situation, and it means that for the foreseeable future EMI will continue to publish under the same arrangements. At the same time, we would naturally like to do better -- to be able to reach more people, and to bring in the money that will enable us to put out a still better publication. The way to do this, of course, is to have more subscribers. We will be working hard on that this year, and we encourage you to help us by spreading the word wherever possible: let people know about EMI, and encourage them to subscribe.

NOTICES/EVENTS

CONCERTS

Here in the San Francisco Bay Area (where EMI is based) we have seen an encouraging number of concerts recently devoted specifically to new instruments, especially in connection with the recent MAKING MUSIC concert series and the ongoing NEW INSTRUMENTS / NEW MUSIC series. It is clear from notices and reports we get from many places that exciting things are happening elsewhere as well, although we don't often receive notice of coming events in time to inform readers in advance. That's too bad, of course, but it is great that the music is being played and heard.

The next presentation in the New Instruments / New Music series will be something a little different. Concert organizers will be gathering a varied crop of new instruments for the occasion; some of them will be briefly demonstrated, and then the concert will be opened up to participatory improvizations in various ensemble groupings, joined in by builders and audience alike. The concerts take place on the first Sunday of odd numbered months (putting the next one on July 5th) at 2:00 at 3016 25th St., San Francisco, CA, 94110; (415) 282-1562.

XEXOXIAL ENDARCHY, 1341 Williamson, Madison, WI 53703, sends the following notices regarding special projects:

AUDIOGEOMANCY (Cassette library of sounds & noises of particular locations). Send your 5 minute sample of any non-musical audio specimen. To receive a collage documentation send a blank 60 minute cassette & SASE for its return. (You may send your sample on the C-60 & I will transfer it to another tape.)

International Music Netquark Projekt: SHEET MUSIC. Sheet music is a continuing series of compilation tapes whose music is somehow derived from a score. Each 90 minute tape will include a booklet of all scores. Emphasis on Audio Art, Sound Poetry, Experimental Noise & Music. SHEET MUSIC ONE will be available in April, $8 for U.S. & $10 outside the country. All submissions should be 5 minutes or less & be recorded on high-bias chromium tape with home dolby. The complete score of the music submitted should be included also & should be b & w (xeroxes of score are acceptable). All contributors will receive one copy of tape & accompanying portfolio of scores. Subsequent copies are available to the artists at cost.

SOUND GARDEN, an exhibition of new sound sculpture, will take place in Tokyo June 17-30. Unfortunately EMI has not learned the specific location as we go to press.

THE CATALOG FOR THE MAKING MUSIC EXHIBIT of new and unusual instruments, including cassette tape, is available for $24 from W.L. Mellintin, PO Box 1119, Menlo Park, CA 94026. See the review in this issue for more information.

THE 1987 NAMM SUMMER EXPO will take place in Chicago's McCormick Place June 27-30. The NAMM show is the music industry's leading venue for exposition of new commercial products.

RECENT ARTICLES APPEARING IN OTHER PUBLICATIONS

Listed below are selected articles of potential interest to readers of **Experimental Musical Instruments** which have appeared recently in other publications.

ACOUSTICS OF ANCIENT CHINESE BELLS, by Sinyan Shen in **Scientific American**, Vol. 256, #4, April, 1987.

Over the last several decades many sets of tuned bells dating from 2000 years ago and more have been unearthed. Only recently have investigators realized that they employ a sophisticated acoustical design which allows each bell to produce two separate and distinct pitches, depending on the striking point. This article explains that design.

MARCO ANTONIO GUIMARAES: A NEW WORLD OF SOUND, by Jonathan Scoville, in his regular "Instrument Innovations" feature in **Percussive Notes**, Volume 25 #2, Winter 1987 (Box 697, 214 W Main St., Urbana, IL 61801-0697).

Following his article on Brazilian instrument inventor Walter Smetak, Jon Scoville presents this discussion of the work of fellow Brazilian Marco Antonio Guimaraes and his group Uakti. Guimaraes makes innovative flutes, percussion and stringed instruments, some elaborated from traditional designs, and some entirely new. Several are described here.

MUSICAL STRINGS by H.E. Huttig, in **American Lutherie** #9, Spring 1987 (8222 S Park Avenue, Tacoma, WA, 98408).

Several people have suggested to EMI that we run something like an "All About Strings" article. We have not been able to come up with such an article yet, but here in the latest **American Lutherie** is a brief but very fine discourse on the subject. It discusses various metals as well as gut, nylon and silk, with something of their history and manufacture. Much of the article is given over to direct quotation from M. Charles Maillot, former directory of the French musical string manufacturing company, Savarez.

AFRICAN ROSEWOOD by John Jordan, also in **American Lutherie** #9 (see above).

This is a highly informative and detailed discussion of the many varieties of some of the most prized instrument building woods.

HARPMAKER'S NOTEBOOK #4 by Mark Bolles, in **Folk Harp Journal** #56, Spring 1987 (4718 Maychelle Dr., Anaheim, CA 92807-3040).

This article describes a program for computer-assisted harp design. Whether or not you are interested in the specifics of the program, there is a lot of practical information on the physical properties of strings of different materials.

Interval, Volume V #3, Winter 1986-1987 (P.O. Box 8027, San Diego, CA 92102) contains several noteworthy articles, especially on the subject of keyboard design:

THE NINETEEN-TONE SYSTEM AS TEN PLUS NINE, by John Negri, includes a design for a nineteen tone keyboard which uses raised black keys of two different lengths.

RATIO KEYBOARD DESIGN presents a design by Harry Partch for his own tuning system. It is presented here posthumously, along with Partch's original explanatory notes. The design and notes were found in a sealed envelope which came into the Interval Foundation's possession and were opened in 1983.

THE GENERALIZED MARIMBA KEYBOARD, by Erv Wilson, is a set of marimba keyboard designs for varying numbers of divisions per octave, along with brief explanatory notes.

Also in this issue of **Interval** is an article by Warren Burt on his set of just tuning forks, recently featured in EMI. In keeping with **Interval**'s editorial orientation, this article emphasizes the tuning system used and its rationale.